

# Indeterminism, Asymptotic Reasoning, and Time Irreversibility in Classical Physics.

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## Abstract

A recent proposal of Norton (2003) to show that a simple Newtonian system can exhibit stochastic acausal behavior by giving rise to spontaneous movements of a mass on the dome of a certain shape is examined. We discuss physical significance of an often overlooked and yet important Lipschitz condition the violation of which leads to the existence of anomalous non-trivial solutions in this and similar cases. We show that the Lipschitz condition is closely linked with the time reversibility of certain solutions in Newtonian mechanics and the failure to incorporate this condition within Newtonian mechanics may unsurprisingly lead to physically impossible solutions that have no serious metaphysical implications. To further support this view we also discuss how certain solutions in hydrodynamics associated with first order differential equations (ODEs) with spatially non-Lipschitz right-hand side lead to lack of important properties such as stability with respect to perturbations and Markovianity in time.

**Keywords:** determinism, indeterminism, acausality, time irreversibility, Lipschitz condition, non-Lipschitz indeterminism, Markov's condition

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